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Discussions

# *Interactive comment on* "Identifying hydrological responses of micro-catchments under contrasting land use in the Brazilian Cerrado" *by* R. L. B. Nobrega et al.

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HESSD-12-9915 "Identifying hydrological responses of micro-catchments under contrasting land use in the Brazilian Cerrado" RLB.Nobrega, AC.Guzha, GN.Torres, K.Kovacs, G.Lamparter, RSS.Amorim, G.Gerold

This is a frustrating piece of work, as it only really reports on some annualised data, with line graphs showing the patchy nature of some of the continuous data, and cannot show uniquely the effects of land-use compared to all other factors. The conclusion that different land covers produce different water balances is in no way controversial,



and this work fails to argue why the Brazilian Cerrado landscape is any different. The water balances are clearly encapsulated in Tables 6 and 7, but show only that 30 to 35% of the water balance is in "lost water" not measured or inferred.

In classical terms, monitoring of catchments of any size for changes in behaviour, either natural variation or sudden land-use changes, was done with pairs of catchments. Then a baseline could be established where all factors matched, or were taken into account by the relationships between their behaviour. Any changes in flow, evapotranspiration, deep recharge, etc, were monitored following land-use change so that the effects of this single variable could be locally quantified. This current work, in an admittedly relatively unstudied biome, has no baseline. There are no relationships between daily or monthly flows established under Cerrado vegetation prior to changes to cropland or pasture. The catchments are not similar enough topographically meaning that rainfall-runoff-throughflow processes are a confounding effect. The cropland micro-catchment is clearly the most interesting and counter-intuitive, but has only half the average slope, for example, and we do not know what the prior stream flow dynamics were to say how different they are now. This catchment also has ~50% clay/~25% sand content in the top 60cm, compared to ~10% clay/~85% sand for the other two micro-catchments (Table 4).

Both cropland and pasture micro-catchments lose about one-third of rainfall in unmeasured losses but with very different mixes of stream flow and evapotranspiration. Table 6 shows that more than 96% of stream flow under each of the land-uses is inferred to be throughflow rather than direct runoff, yet the authors discuss differences in quickflow for nearly 2-pages. This is clearly not the first-order process of interest where the biggest changes are expected to occur. There is insufficient length, or depth, of soil moisture measurement to help delineate differences between recharge and soil water storage changes.

I want to encourage the authors to continue to monitor and study these sites, however what is presented is some short-term preliminary data which cannot clearly articulate what is happening within and between the three micro-catchments. For the Cerrado and pasture catchments with similar soils and topography, comparisons of evapotranspiration and stream flow using standard annualised water balance techniques is fully justified, e.g. Schreiber, Budyko, Pike, Choudhury, Milly, Fu, Zhang. This might show their similarity to other international catchments, or highlight why they are different enough from standard models of catchment hydrology to be more intensively studied. Variations between micro-catchments with greater differences might be explored using the simplest of daily-time-step water-balance models such as SIMHYD, with only 7 parameters, that has been applied at both local and regional scales, and for hundreds of catchments (Chiew x 3).

Some mundane referencing issues:

P9919 L9: Silva Junior et al (1999) not in references, may be Silva et al (1999)?

P9922 L9: EMBRAPA (1998) not in references, may be EMBRAPA 1997?

P9922 L25: Silva Junior (2005) not in references, may be Silva Junior (2004)?

P9931 L2: Base et al (2012) not in references

P9938 L6: Lima (2000) not in references

P9939 L10: Moraes et al (2006) not in references

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